

WHAT IS CLAIMED IS:

1 1. A method for mapping a user function for a programmable integrated
2 circuit to a plurality of lookup tables, the method comprising:
3 decomposing the user function into a first set of decomposed functions, the
4 user function receiving input variables;
5 determining whether the first set of decomposed functions can be implemented
6 by one of a set of lookup table configurations for the programmable integrated circuit; and
7 if none of the set of lookup table configurations can implement the first set of
8 decomposed functions, rotating at least two of the input variables of the user function.

1 2. The method according to claim 1 further comprising:
2 decomposing the user function into a second set of decomposed functions; and
3 determining whether the second set of decomposed functions can be
4 implemented by one of the set of lookup table configurations for the programmable
5 integrated circuit.

1 3. The method according to claim 1 further comprising:
2 if the user function is not successfully decomposed into a set of decomposed
3 functions, rotating at least two of the input variables of the user function; and
4 attempting to decompose the user function into a second set of decomposed
5 functions.

1 4. The method according to claim 1 further comprising:
2 if one of the lookup table configurations can implement the first set of
3 decomposed functions, placing lookup tables in the lookup table configuration into logic
4 blocks on the programmable integrated circuit; and
5 configuring programmable routing resources to connect the logic blocks on the
6 programmable integrated circuit.

1 5. The method according to claim 4 wherein one of the lookup table
2 configurations includes two 5-input lookup tables and one 6-input lookup table.

1 6. The method according to claim 4 wherein at least two of the input
2 variables are shared between two of the lookup tables.

1 7. The method according to claim 4 wherein one of the lookup table
2 configurations includes two 4-input lookup tables and one 6-input lookup table.

1 8. The method according to claim 1 wherein decomposing the user
2 function into the first set of decomposed functions further comprises decomposing the user
3 function into first stage functions and a second stage function,
4 outputs of the first stage functions being inputs into the second stage function.

1 9. The method according to claim 8 wherein rotating at least two of the
2 input variables of the user function further comprises swapping at least one of the input
3 variables of the first stage functions with at least one of the input variables of the second
4 stage function.

1 10. The method according to claim 9 further comprising:
2 attempting to decompose the user function into a second set of decomposed
3 functions based on the rotated-input variables.

1 11. A computer program product stored on a computer readable medium
2 for mapping a user function for a programmable integrated circuit to lookup tables, the
3 computer program product comprising:
4 code for decomposing the user function into a first set of decomposed
5 functions, wherein the user function receives input variables;
6 code for determining whether the first set of decomposed functions can be
7 performed by a configuration of lookup tables on the programmable integrated circuit; and
8 code for rotating at least two of the input variables of the user function if none
9 of the configurations of lookup tables can implement the first set of decomposed functions.

1 12. The computer program product according to claim 11 further
2 comprising:
3 code for rotating at least two of the input variables of the user function if the
4 user function is not successfully decomposed into a set of decomposed functions; and
5 code for attempting to decompose the user function into a second set of
6 decomposed functions.

1 13. The computer program product according to claim 11 wherein the code
2 for decomposing the user function into the first set of decomposed functions further
3 comprises code for decomposing the user function into first stage functions and a second
4 stage function, outputs of the first stage functions being inputs into the second stage function.

1 14. The computer program product according to claim 13 wherein the code
2 for decomposing further comprises:

3 code for decomposing the user function into a second set of decomposed
4 functions based on the rotated input variables, the second set of decomposed functions
5 including first stage functions and a second stage function,

6 wherein at least two input variables of the first and the second stages of the
7 second set of decomposed functions have been rotated with respect to input variables of the
8 first and the second stages of the first set of decomposed functions.

1 15. The computer program product according to claim 11 wherein the code
2 for decomposing the first function into the second functions further comprises code for
3 decomposing the first function into the second functions using a non-disjoint decomposition
4 technique.

1 16. The computer program product according to claim 11 wherein the code
2 for decomposing the first function into the second functions further comprises code for
3 decomposing the first function into the second functions using a disjoint decomposition
4 technique.

1 17. The computer program product according to claim 11 further
2 comprising:
3 code for placing lookup tables in one of the lookup table configurations into
4 logic blocks on the programmable integrated circuit, if that lookup table configurations can
5 implement the decomposed functions; and
6 code for configuring programmable routing resources to connect the logic
7 blocks on the programmable integrated circuit.

1 18. The computer program product according to claim 11 wherein one of
2 the lookup table configurations includes two 5-input lookup tables and one 6-input lookup
3 table.

1 19. The computer program product according to claim 11 wherein one of
2 the lookup table configurations includes two 4-input lookup tables and one 6-input lookup
3 table.

1 20. The computer program product according to claim 11 further
2 comprising:
3 code for decomposing the user function into a second set of decomposed
4 functions based on the rotated input variables, if none of the configurations of lookup tables
5 can implement the first set of decomposed functions; and
6 code for determining whether the second set of decomposed functions can be
7 implemented by one of the configurations of lookup tables for the programmable integrated
8 circuit.